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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/550,805	07/12/2006	Tominaga Koji	FUJ-0001	3990
23413 7590 04/30/2008 CANTOR COLBURN, LLP 20 Church Street 22nd Floor Hartford, CT 06103				
EXAMINER				
LUKE, DANIEL M				
ART UNIT		PAPER NUMBER		
2813				
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04/30/2008		PAPER		

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

# Office Action Summary

**Application No.**

10/550,805

**Applicant(s)**

KOJI ET AL.

**Examiner**

DANIEL LUKE

**Art Unit**

2813

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 14 January 2008.  
2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.  
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-9 is/are pending in the application.  
4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.  
6) ☒ Claim(s) 1-9 is/are rejected.  
7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.  
8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.  
10) ☒ The drawing(s) filed on 14 January 2008 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)  
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)  
3) ☐ Information Disclosure Statement(s) (PTO/5508)  
Paper No(s)/Mail Date \_\_\_\_\_  
4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_  
5) ☐ Notice of Informal Patent Application  
6) ☐ Other: \_\_\_\_\_

### **DETAILED ACTION**

This office action is in response to the amendment filed 1/14/2008.

Currently, claims 1-9 are pending. Claims 8 and 9 have been added.

### ***Drawings***

The drawings were received on 1/14/2008. These drawings are acceptable.

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1-9 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. In each of independent claims 1, 8 and 9, it is stated that an insulating film is formed having a thickness in the range of 0.3 to 2 nm (or 0.5 to 2 nm, as claimed in claim 8), and impurities are removed a plurality of times. This is not supported in the specification. Instead, the specification discloses that an insulating film is formed to a prescribed thickness by forming multiple sublayers and removing impurities between each sublayer formation step. These sublayers are in the range of 0.3 to 2 nm. Thus, according to the specification, an insulating layer having a thickness in the range of 0.3 to 2 nm formed by the method disclosed in the specification would only require one step of

removing impurities, and not a plurality of such steps. Or, since 0.3 to 2 nm is the general range of one monolayer of insulating material, a process requiring a plurality of impurity removal steps would produce several monolayers of insulating material, and thus would be thicker than the 0.3 to 2 nm range. Either way, the specification does not support a plurality of impurity removing steps in the same embodiment as a final insulating film having a thickness between 0.3 and 2 nm.

### *Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1 and 8 are rejected under 35 U.S.C. 102(e) as being anticipated by Conley et al. (US 2004/0203254).

Pertaining to claim 1, Conley shows a method, comprising: forming an insulating film in a semiconductor device ([0002]), wherein the insulating film has a thickness in the range of 0.3 to 2 nm ([0059]); and removing impurities from the insulating film a plurality of times ([0053], lines 1-3 and [0052], lines 12-14), wherein the removing impurities is performed at a temperature greater than 500°C ([0052], lines 10-14), to form an insulating film having a prescribed thickness ([0053], lines 1-3).

Pertaining to claim 8, Conley shows a method, comprising: forming an insulating film in a semiconductor device ([0002]), wherein the insulating film has a thickness in the range of 0.5

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to 2 nm ([0059]); and removing impurities from the insulating film a plurality of times to form an insulating film having a prescribed thickness ([0053], lines 1-3 and [0052], lines 12-14).

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 2-7 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Conley in view of Colombo et al. (US 2005/0136690).

Conley shows the method of claim 1.

Pertaining to claim 9, Conley shows a method, comprising: forming an insulating film in a semiconductor device ([0002]), wherein the insulating film has a thickness in the range of 0.3 to 2 nm ([0059]); and removing impurities from the insulating film a plurality of times to form an insulating film having a prescribed thickness ([0053], lines 1-3 and [0052], lines 12-14).

Conley fails to show, pertaining to claim 2, removing impurities is performed in a reducing gas atmosphere; and, pertaining to claims 3 and 9, removing impurities comprises a first treatment in a reducing gas atmosphere and a second treatment in an oxidizing gas atmosphere. Pertaining to claims 4-7, Conley fails to show the possible gases that make up the reducing and oxidizing gas atmospheres.

However, Colombo teaches in [0013] – [0014] that a high-k dielectric film is subjected to two anneals, both at temperatures in the range of 500°C to 1100°C. The first anneal is performed

in a reducing gas atmosphere ([0013], lines 1-4). The reducing gas atmosphere may comprise, for example, hydrogen ([0013], lines 7-8). The second anneal is performed in an oxidizing gas atmosphere ([0014], lines 1-4). The oxidizing gas atmosphere may comprise, for example, oxygen. These anneals act to remove impurities from the dielectric film ([0011]).

It would have been obvious to one of ordinary skill in the art, at the time the invention was made, to perform the step of removing impurities in the method of Conley by a two-step anneal process in which the first anneal is performed in a reducing gas atmosphere and the second anneal is performed in an oxidizing gas atmosphere, as taught by Colombo. The motivation to do so is that the anneal process taught by Colombo reduces point defects and impurities in the dielectric film ([0005]).

### ***Response to Arguments***

Applicant's arguments with respect to claims 1-7 have been considered but are moot in view of the new ground(s) of rejection.

### ***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after

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the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DANIEL LUKE whose telephone number is (571)270-1569. The examiner can normally be reached on Monday through Friday 8:30 a.m. to 5:00 p.m. EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr. can be reached on (571) 272-1702. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/D. L./  
Examiner, Art Unit 2813  
4/22/2008

/Carl Whitehead Jr./  
Supervisory Patent Examiner, Art Unit  
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